AMENDMENT TO THE CLAIMS

1. (currently amended) A battery charging system tester configured to test a battery charging system of a vehicle, comprising:

cabling configured to electrically couple to a battery of the vehicle;

a display configured to display information;

a microprocessor configured to:

perform a battery test on the battery;

perform a starter test on a starter of the vehicle; and

perform a charging system test on a charging system of the vehicle; ~~and~~

providing ~~output~~outputs related to the battery test, starter test, and charger system test; and

wherein the tester is portable.

2. (original) The apparatus of claim 1 including a user input configured to receive a battery rating from a user.

3. (original) The apparatus of claim 2 wherein the user input is further configured to receive a rating standard selection from the user.

4. (original) The apparatus of claim 3 wherein the rating standard selection comprises an SAE standard.

5. (original) The apparatus of claim 3 wherein the rating standard selection comprises a DIN standard.

6. (original) The apparatus of claim 3 wherein the rating standard selection comprises an IEC standard.

7. (original) The apparatus of claim 3 wherein the rating standard selection comprises an EN standard.

8. (original) The apparatus of claim 3 wherein the rating standard selection comprises a JIS standard.

9. (original) The apparatus of claim 1 wherein the battery test is based upon conductance.

10. (original) The apparatus of claim 1 wherein the battery test is based upon resistance.

11. (original) The apparatus of claim 1 wherein the battery test is based upon impedance.

12. (original) The apparatus of claim 1 wherein the battery test is based upon admittance.

13. (original) The apparatus of claim 1 wherein an operator is instructed to start an engine of the vehicle for the starter test.

14. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises cranking voltage.

15. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises an output indicating "good battery".

16. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises an output indicating "good but recharge battery".

17. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises an output indicating "charge and retest battery".

18. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises an output indicating "replace battery".

19. (currently amended) The apparatus of claim 1 wherein ~~the~~one output comprises an output indicating "bad cell-replace battery".

20. (original) The apparatus of claim 1 wherein the charging system test includes measuring a voltage when an engine of the vehicle is revved and no vehicle loads are applied.

21. (original) The apparatus of claim 1 wherein the charging system test includes measuring a voltage when the engine is idle and a vehicle load is applied.

22. (original) The apparatus of claim 1 wherein the charging system test includes measuring a voltage when the engine is revved and a vehicle load is applied.

23. (original) The apparatus of claim 1 wherein the charging system test includes measuring AC voltage ripple.

24. (original) The apparatus of claim 1 including a user input configured to receive a temperature.

25. (original) The apparatus of claim 1 wherein the battery test is a function of a temperature.

26. (original) The apparatus of claim 1 wherein the microprocessor is configured to determine if surface charge exists on the battery.

27. (original) The apparatus of claim 26 wherein the microprocessor prompts an operator to turn on headlights of the vehicle based upon a surface charge determination.

28. (original) The apparatus of claim 1 wherein an output is printed based upon a test.

29. (currently amended) The apparatus of claim 1 including a display configured to display the outputs.

30. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises battery rating.

31. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises measured battery capacity.

32. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises voltage.

33. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises voltage during cranking.

34. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises idle voltage.

35. (currently amended) The apparatus of claim 1 wherein ~~the~~an output comprises load voltage.

36. (currently amended) The apparatus of claim 1 wherein ~~the~~an output is indicative of a presence of excessive diode ripple voltage.

37. (original) The apparatus of claim 1 wherein AC and DC voltages are recorded.

38. (original) The apparatus of claim 1 wherein a voltage across the battery is recorded.

39. (original) The apparatus of claim 1 wherein the battery test is used to prevent incorrectly identifying the charging system as being faulty.

40. (original) The apparatus of claim 1 including an analog to digital converter.

41. (original) The apparatus of claim 1 including an amplifier configured to couple across a positive and a negative terminal of the battery.

42. (original) The apparatus of claim 1 including an amplifier coupled to the battery through a capacitor.

43. (original) The apparatus of claim 1 including a battery voltage scaling circuit.

44. (original) The apparatus of claim 1 wherein the starter test is a function of the battery test.

45. (original) The apparatus of claim 1 wherein the charging system test is a function of the battery test.

46. (original) The apparatus of claim 1 wherein the charging system test is a function of the battery test.

47. (original) The apparatus of claim 1 including DC voltage sensor adapted to measure a DC voltage of the battery and an AC voltage ripple detector adapted to measure an AC ripple voltage across the battery.

48. (original) The apparatus of claim 1 wherein the microprocessor is further adapted to measure a starting voltage across the battery while a starting motor of the vehicle is actuated to start an engine of the vehicle.

49. (original) The apparatus of claim 1 wherein the microprocessor provides an output indicating that the battery requires charge if a starting voltage is low and the battery test indicates that the battery is discharged.

50. (original) The apparatus of claim 1 wherein the microprocessor provides a cranking voltage low output indication if the starting voltage is low and the battery test indicates the battery is fully charged.

51. (original) The apparatus of claim 1 wherein the microprocessor provides a cranking voltage normal output if a starting voltage is normal and the battery test indicates the battery is fully charged.

52. (original) The apparatus of claim 1 wherein the microprocessor measures a steady state battery voltage with the engine off, a battery voltage with the engine revved, a battery voltage with the engine idling and a load applied to the battery,

and a battery voltage with this engine revved and a load applied to the battery.

53. (original) The apparatus of claim 1 wherein the microprocessor is adapted to receive an input indicating that the vehicle contains a diesel engine and wherein the microprocessor waits for glow plugs of the diesel engine to warm up and charging to start.

54. (original) The apparatus of claim 23 wherein an AC ripple voltage more than about 130 mV indicates a faulty diode or stator in the charging system.

55. (canceled)

56. The apparatus of claim 1 wherein the tester is portable.

The apparatus of claim 1 wherein the battery test does not include a load test.

57. (currently amended) A method in a battery charging system tester for testing a battery charging system of a vehicle, comprising:

(a) performing a battery test on the battery;

(b) performing a starter test on a starter of the vehicle;

(c) performing a charging system test on a charging system of the vehicle; ~~and~~

(d) displaying an output related to at least one of the battery test, starter test and charging system test on a display; and

(e) implementing steps (a) - (d) in a portable tester.

58. (original) The method of claim 57 including receiving a user input related to a battery rating from a user.

59. (original) The method of claim 58 wherein the user input is related to a rating standard selection from the user.

60. (original) The method of claim 59 wherein the rating standard selection comprises an SAE standard.

61. (original) The method of claim 59 wherein the rating standard selection comprises a DIN standard.

62. (original) The method of claim 59 wherein the rating standard selection comprises an IEC standard.

63. (original) The method of claim 59 wherein the rating standard selection comprises an EN standard.

64. (original) The method of claim 59 wherein the rating standard selection comprises a JIS standard.

65. (original) The method of claim 57 wherein the battery test is based upon conductance.

66. (original) The method of claim 57 wherein the battery test is based upon resistance.

67. (original) The method of claim 57 wherein the battery test is based upon impedance.

68. (original) The method of claim 57 wherein the battery test is based upon admittance.

69. (original) The method of claim 57 including instructing an operator to start an engine of the vehicle for the starter test.

70. (original) The method of claim 69 wherein the output comprises cranking voltage.

71. (original) The method of claim 57 wherein the output comprises an output indicating "good battery".

72. (original) The method of claim 57 wherein the output comprises an output indicating "good but recharge battery".

73. (original) The method of claim 57 wherein the output comprises an output indicating "charge and retest battery".

74. (original) The method of claim 57 wherein the output comprises an output indicating "replace battery".

75. (original) The method of claim 57 wherein the output comprises an output indicating "bad cell-replace battery".

76. (original) The method of claim 57 wherein performing a charging system test includes measuring a voltage when an engine of the vehicle is revved and no vehicle loads are applied.

77. (original) The method of claim 57 wherein performing a charging system test includes measuring a voltage when the engine is idle and a vehicle load is applied.

78. (original) The method of claim 57 wherein performing a charging system test includes measuring a voltage when the engine is revved and a vehicle load is applied.

79. (original) The method of claim 57 wherein performing a charging system test includes measuring AC voltage ripple.

80. (original) The method of claim 57 including receiving a temperature.

81. (original) The method of claim 80 wherein performing a battery test is a function of a temperature.

82. (original) The method of claim 57 including determining if surface charge exists on the battery.

83. (original) The method of claim 82 including prompting an operator to turn on headlights of the vehicle based upon a surface charge determination.

84. (original) The method of claim 57 including printing the output.

85. (original) The method of claim 57 wherein the output comprises battery rating.

86. (original) The method of claim 57 wherein the output comprises measured battery capacity.

87. (original) The method of claim 57 wherein the output comprises voltage.

88. (original) The method of claim 57 wherein the output comprises voltage during cranking.

89. (original) The method of claim 57 wherein the output comprises idle voltage.

90. (original) The method of claim 57 wherein the output comprises load voltage.

91. (original) The method of claim 57 wherein the output is indicative of a presence of excessive diode ripple voltage.

92. (original) The method of claim 57 including recording AC and DC voltages.

93. (original) The method of claim 57 including recording a voltage across the battery.

94. (original) The method of claim 57 including using the battery test to prevent incorrectly identifying the charging system as being faulty.

95. (original) The method of claim 57 including digitizing a voltage.

96. (original) The method of claim 57 including coupling an amplifier to the battery through a capacitor.

97. (original) The method of claim 57 including scaling a battery voltage.

98. (original) The method of claim 57 wherein performing a starter test is a function of the battery test.

99. (original) The method of claim 57 wherein performing a charging system test is a function of the battery test.

100. (original) The method of claim 57 wherein performing a charging system test is a function of the battery test.

101. (original) The method of claim 57 including measuring a DC voltage of the battery and measuring an AC ripple voltage across the battery.

102. (original) The method of claim 57 including measuring a starting voltage across the battery while a starting motor of the vehicle is actuated to start an engine of the vehicle.

103. (original) The method of claim 57 including providing an output indicating that the battery requires charge if a starting voltage is low and the battery test indicates that the battery is discharged.

104. (original) The method of claim 57 including providing a cranking voltage low output indication if the starting voltage is low and the battery test indicates the battery is fully charged.

105. (original) The method of claim 57 including providing a cranking voltage normal output if a starting voltage is normal and the battery test indicates the battery is fully charged.

106. (original) The method of claim 57 including measuring a steady state battery voltage with the engine off, a battery voltage with the engine revved, a battery voltage with the engine idling and a load applied to the battery, and a battery voltage with this engine revved and a load applied to the battery.

107. (original) The method of claim 57 including receiving an input indicating that the vehicle contains a diesel engine and

waiting for glow plugs of the diesel engine to warm up and charging of the battery to start.

108. (original) The method of claim 57 wherein an AC ripple voltage more of than about 130 mV indicates a faulty diode or stator in the charging system.

109. (currently amended) A battery charging system tester, comprising:

a user input configured to receive an input from an operator;

a display configured to display an output to the operator;

an electrical connection configured to electrically couple to an electrical system of a vehicle;

an analog to digital converter configured to provide a digital output related to voltages measured through the electrical connection; ~~and~~

a microprocessor connected to the user input display and analog to digital converter configured to receive information related to a voltage during starting of an engine of the vehicle, a voltage during revving of the engine of the vehicle, and a temperature and further configured to perform a starter test on a starter of the vehicle and a charging system test on the charging system of the vehicle; and

wherein the battery charging system tester is portable.

110. (canceled).

111. (original) The apparatus of claim 109 wherein the starter test is a function of a battery test.

112. (original) The apparatus of claim 109 wherein the charging system test is a function of a battery test.